

REMARKS

Claim to Priority Not Acknowledged

As a preliminary matter, the Applicants note that this application claims priority, pursuant to 35 U.S.C. §119(e), of U.S. Provisional Application No. 60/219,974, filed July 21, 2000. The Applicants note, however, that the Examiner did not check box 14 on PTO form 326, acknowledging the claim for domestic priority. The Applicants respectfully request that the Examiner acknowledge the claim at the next opportunity to do so. This matter was raised by the Applicants in the previous response. However, Applicants note that the Examiner did not comment on this matter in the current Office Action.

Amendment to the Specification

The Applicant has amended paragraph 17 in the detailed description section to correct a typographical error in the first sentence. This sentence has been amended to say “without a turbine motor.” This amendment does not constitute a new matter as it is a correction of a typographical error and not a substantive change to the specification.

Disposition of Claims

Claims 1-3 are pending in this application. By way of this reply, claims 1-3 have been amended. Additionally, new claims 4-8 have been added. Support for these claims may be found on pages 5-6 of the specification as originally filed. No new matter has

been added. Claims 1, 5, and 6 are independent. The remaining claims depend from those claims.

Claim Amendments

Claims 1-3 have been amended to contain consistent language for “turbine-type mud motor” and “bi-center drill bit.” No new matter has been added by way of these amendments as they are meant to clarify the language of the claims.

Rejection(s) under 35 U.S.C § 102

Claims 1-3 stand rejected under 35 U.S.C. § 102 as anticipated by U.S. Patent No. 5,957,223, issued to Doster et al. (“Doster”). This rejection is respectfully traversed.

Claim 1 recites a method for drilling a wellbore comprising operating a turbine-type mud motor coupled to a bi-center drill bit, and applying a selected axial force to the bit so that it drills in a directionally stable manner. This method advantageously provides the ability to maintain a desired rate of penetration (ROP) while lessening the required weight on bit (WOB), thereby permitting the use of bi-center bits in applications for which they were previously unsuited due to their tendency to deviate from a desired trajectory with higher WOB.

In directional drilling, where maintaining a desired trajectory is critical, bi-center bits have been disfavored because of their tendency to exhibit directional instability. Applicants have noted that this instability increases with increased WOB, particularly in light of the fact that stabilizers cannot readily be used with bi-center bits (Paragraph 16 of the Specification). Embodiments of the present invention advantageously address this

inherent directional instability of bi-center bits by providing an increased RPM to the bit while lowering the WOB so that directional stability is increased, particularly in directional drilling applications.

In contrast to the invention of claim 1, Doster fails to consider WOB as a significant source of instability in bi-center bits. Instead Doster considers only the radial forces generated by the rotation of the bit in conjunction with the imbalance between the separate groups of cutters on the reamer and pilot bit sections of Doster's bi-center bit:

The inventors herein have... concluded that **the [imbalanced] loading problem is [the result of] drastically misaligned orientations and difference in relative magnitudes of the composite or resultant radial force vector generated by the group of cutters on the pilot bit section in comparison to the radial force vector generated by the group of cutters on the reamer bit section.** Such misalignment causes the bi-center bit to tilt or cock in the borehole, as the longitudinally offset, radially misaligned force vectors augment each other, driving the bit away from a desirable orientation.

Col. 2, l. 64 – Col. 3, l. 9 (emphasis added).

Furthermore, the bi-center bit according to Doster is “**designed from a cutter placement and orientation standpoint** to place the **resultant lateral or radial force vectors F1 and F2** in substantial mutual directional alignment **transverse to the longitudinal bit axis.**” (Col. 3, ll. 50-54) Notably, Doster does not address the axial forces placed on the bit, much less select and apply such forces so that the bit drills in a directionally stable manner. Instead, Doster addresses directional instability through *cutter placement and orientation*. Furthermore, Applicants respectfully disagree with the Examiner's assertion that “lateral forces F1 and F2, in fact must have been generated from an axial force or weight on bit (WOB).” As discussed above, Doster's invention is

based on the premise that instability of a bi-center bit is due to *misaligned orientations of the cutters* on the pilot bit and reamer, and the resultant imbalance of the *radial force vectors* generated by this misalignment. Accordingly, it is only these elements that are addressed by Doster.

With regards to mud motors, the Applicant note that two primary types exist in the art--turbine and positive displacement motors ("PDM"). The two share the common trait of using fluid flow to generate rotation. Turbine motors and PDM's are, however, not equivalent. The operating range of torque, flow, and pressure is very wide for a PDM. Additionally, the torque and hydraulic horsepower generated by a PDM increases smoothly with fluid flow. The mud motor spoken of in Doster (col. 5, lines 26-28) is clearly a PDM due to the surrounding explanation.

Turbines require maintaining a significantly higher number of revolutions per minute ("RPM") to prevent stalling, as compared to PDM's. The Applicant has discovered that low WOB allows for stable drilling with a bi-center bit. Too much WOB will result in stalling because high WOB will cause the bit to torque up and exceed the torque capacity of the turbine. This low WOB would result in poor ROP if it did not have high RPM.

In contrast, a PDM does not have the capacity to provide the necessary RPM's when WOB is reduced to a level sufficient for stable drilling with a bi-center bit. Simply put, PDM's are not capable of operating at high levels of RPM's. Advantageously, a turbine mud motor allows for commercially acceptable ROP to be achieved with the low WOB and high RPM that only a turbine can provide.

In view of the above, Doster fails to disclose or suggest a method according to claim 1, wherein an axial force is selected and applied to a bi-center drill bit coupled to a turbine-type mud motor so that the bit drills in a directionally stable manner. Thus, claim 1 is patentable over Doster. Dependent claims 2 and 3 are allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

New Claims

By way of this reply, claims 4-8 have been added. Claim 5 is a method claim for operating a turbine-type mud motor to rotate a bi-center drill bit at a high rate of revolution to provide a directionally stable drilling. The high rate of revolution limitation finds support in paragraph 17 of the specification. Claim 6 is an apparatus claim for a turbine-type mud motor with a bi-center drill bit.

Further, dependent claims have been added that recite the use of the asymmetric drill bit. This limitation finds support in paragraph 17 of the specification and, therefore, does not constitute new subject matter.

Conclusion

Applicants believe this reply is fully responsive to all outstanding issues and places this application in condition for allowance. If this belief is incorrect, or other issues arise, the Examiner is encouraged to contact the undersigned or his associates at the telephone number listed below. Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference Number 05516.079002).

Respectfully submitted,

Date: 12/15/03

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